Practitioner's Docket No.: 283.237.10CPA **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: Robert J. Hennick, et al.

Ser. No.: 09/312,479 Group Art Unit: 2878

Filed: January 10, 2002 Examiner: Juu, Thanh X

For: OPTICAL AND IMAGE SENSOR SUBASSEMBLY ALIGNMENT AND MOUNTING METHOD

#22 Appeal Brief T. Wang 5-1-03

Assistant Commissioner for Patents
Attn: Board of Patent Appeals and Interferences
Washington, DC 20231

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail addressed to **Assistant Commissioner for Patents, Attn: Board of Patent Appeals and Interferences, Washington D.C. 20231,** on April 10, 2003.

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Sir:

APPEAL BRIEF

This application is before the Honorable Board of Appeals on appeal from the final rejection by the Examiner dated January 8, 2003, wherein claims 1-37 and 45-108 were finally rejected.

I. REAL PARTY IN INTEREST

An assignment of the invention claimed in this application from the Appellant to Welch Allyn, Inc., is recorded in the U.S. Patent and Trademark microfilm records at Reel 010174, Frame 0258. Accordingly, the real party in interest is Welch Allyn, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant, the Appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-37 and 45-108 are pending in the application. The rejections of claims 1-37 and 45-108 are appealed. The claims are set forth in the Appendix to this brief.

IV. STATUS OF AMENDMENTS AFTER FINAL REJECTION

There were no amendments to the claims made after the Final Office Action dated January 8, 2003.

V. SUMMARY OF INVENTION

The present invention comprises a method and apparatus for establishing a desired spacial relationship between an imager sensor subassembly and an optical subassembly. That desired relationship is not necessarily a fixed distance between the two components but will tend to vary even with the same batch components. Accordingly the desired relationship is determined by the actual performance of the components as they are selectively spacial moved until a desired image quality results. At that time, the relative positions are fixed by a soldering cross hair. However, at the time the soldering occurs, the two components are not limited in their movement toward each other but are free to be moved until they arrive at the point where to proper performance is obtained.

VI. ISSUE

The issues are:

1) Whether claims 1 and 82 are anticipated by Masuko et al. (U.S. Patent 5,023,443).

2) Whether claims 1, 2, 7, 8, 80 and 82 are anticipated by Wise et al. (U.S. Patent 5,100,479).

3) Whether claims 26-29 and 31 are anticipated by Kawaguchi (U.S. Patent 5,171,985).

4) Whether claims 59, 61-64, 66, 68-71 and 89-92 are anticipated by Kanaya et al. (U.S. Patent 5,155,401)

5) Whether claims 13, 15, 18, 23, 24, 32, 33, 35, 37, 46, 47, 49, 52, 53, 55, 57, 83, 86-88, 95, 96, 98, 101-103, 105 and 106 are anticipated by Kropp (U.S. Patent 5,902,997).

6) Whether claims 14, 16, 17, 19-22, 25, 34, 36, 48, 50, 51, 54, 56, 58, 84, 85, 97, 99, 100, 104, 107 and 108 are obvious over Kropp.

7) Whether claims 60, 65, 67 and 72 are obvious over Kanaya et al.

8) Whether claims 78 and 79 are obvious over Christensen.

9) Whether claim 30 is obvious over Kawaguchi.

10) Whether claims 3-6 and 45 are obvious over Wise et al.

11) Whether claims 9-12 and 81 are obvious over Wise et al. in view of Kawaguchi.

VII. GROUPING OF CLAIMS

All of the claims stand or fall together.

VIII. ARGUMENTS

1. Claims 1 and 82 are finally rejected under 35 U.S.C. 102(b) as being anticipated by Masuko et al. (U.S. Patent 5,023,443).

The Masuko reference describes a photo-semiconductor module having a casing 30 to which a ceramic substrate 31 is soldered. In separate operations, a support arm 35 having a semi-spherical lens 36 attached thereto is soldered to the substrate 31, and then a photo diode chip 33 is also soldered to the ceramic substrate 31. This is accomplished with no requirement for accurately positioning the photo diode chip 33 with respect to the semi-spherical lens 36. The lens 36 is merely mounted above the photo diode chip 33 and at an angle of 45° relative thereto. It is then the next step in which the alignment is critical. That is, an optical fiber 41 is secured to the side wall of the casing 30, and "then the PD chip 33 accommodated in the casing 30 and the optical fiber 41 are optically coupled to each other" (column 5, lines 8-10).

This is substantially different from the applicants invention wherein the relative placements of the optical subassembly and the image sensor subassembly are the critical issue. Referring to claim 1, the preamble recites a method for mounting an optical subassembly to an image sensor subassembly. In the Masuko et al., reference, this does not occur. Rather, both the support arm 35 with its semi-spherical lens 36, and the photo diode chip 33 are secured to a ceramic substrate rather then their being one mounted to the other as recited in claim 1. A further recitation in claim 1 recites the step of "soldering said optical and image sensor subassemblies together using a solder material. Again, in the Masuko reference,

those elements are not soldered together but are rather each soldered to a ceramic substrate. Thus, not only does Masuko et al., not have the structural limitations as set forth in claim 1, but neither does it have the need to do so since the co-alignment of these two elements is not critical for the reasons discussed hereinabove.

In respect to the final rejection of claim 82 under 35 U.S.C. 102(b) as being anticipated by Masuko et al., claim 82 is an apparatus claim which is dependent on claim 79, which is not rejected on the basis of Masuko et al. Accordingly, it is believed that the Examiner is mistaken and that his rejection is improper.

2. Claims 1, 2, 7, 8, 80 and 82 are finally rejected under 35 U.S.C. 102(b) as being anticipated by Wise et al. (U.S. Patent 5,100,479). Further, claims 3-6 and 45 are finally rejected under 35 U.S.C. 103(a) as being obvious over Wise et al.

The Wise et al., reference shows an infrared detector 10 mounted inside a casing 12. Output leads 14 are connected to output pads 26 of the detector 10 at bonding regions 16 using a solder material. The output leads 14 typically connect the detector to processing circuitry. A window 13 in the casing 12 allows infrared radiation to strike the thermopiles 24 through a dielectric membrane 40 formed in aperture 22. In his explanation, the Examiner refers to the casing 12 as "an optical subassembly". Although the casing 12 has an opening or window 13 through which the infrared radiation is permitted to pass, it can not reasonably be considered "an optical subassembly" of the type intended by the applicant. That is, in the present case, the optical subassembly comprises a framework which holds a lens for focusing the light passing therethrough. The purpose and the structure of the present invention as recited in claim 1 is that of aligning the lens of the optical subassembly such that it coincides with the image sensor when the two subassemblies are interconnected.

Considering the recitation of claim 1 as discussed hereinabove regarding the step of soldering the optical and image sensor subassemblies together, in order for the Wise et al., reference to anticipate the invention as recited in claim 1, it would be necessary for the optical subassembly to not only include the casing 12 but also the leads 14, and for the image sensor assembly to also include the output pads 26, such that the optical subassembly is soldered to the image sensor assembly. The

applicants believe that is an unreasonably broad and inaccurate interpretation of the teachings of the Wise et al., reference.

The positioning of the casing 12 in respect to the detector 10 is not critical as in the case of the present invention. Although the window 13 needs to be placed over the detector 10 such that the infrared radiation may pass through the casing 12, its exact positioning is not critical. In this regard, it should be noted that the aperture 22, which functions as the window through which the infrared radiation is detected, is probably more critical, and therefore the particular placement of the rim 20 with respect to the thermopiles 24 is the relative positioning that is more closely controlled in accordance with the process as set forth in the Wise et al., reference.

In respect to the step of the soldering the output pads 26 to the pins 14, there is no mention of a step of aligning the respective elements nor the need to do so. Thus, one skilled in the art would simply understand that reference to teach that the soldering process was simply a way to electrically interconnect the leads 14 to the output pads 26, rather then as a method of interconnecting two elements that are being closely co-aligned.

For the reasons discussed hereinabove the applicants believe that the Wise et al., reference neither shows nor suggests the method as set forth in claim 1. The claims that are dependent on claim 1 recite further steps that would further distinguish over the Wise et al., reference.

In respect to the rejection of claims 80 and 81 in view of the Wise et al., reference, the applicants are confused inasmuch as those claims are dependent on claim 79 which is an apparatus claim. Again, the applicants request that the Examiner correct or clarify his position in this regard.

3. Claims 26-29 and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawaguchi (U.S. Patent 5,171,985). Further, claim 30 is rejected under 35 U.S.C. 103(a) as being obvious over Kawaguchi and claims 9-12 and 81 are rejected under 35 U.S.C. 103(a) as being obvious over Wise et al. in view of Kawaguchi.

The Kawaguchi reference shows a C shaped resin molding 9 mounted on a base 12, with the molding 9 having mounted therein a plurality of leads 5-1 through 5-4. Attached to the lead 5-1 is a light emitting element 1, and attached to the lead 5-2 is a light receiving element 2, with the tube being mounted such that the light

emitting element 1 is aligned with the light receiving element 2. The resin molding 9 is mounted on the base 12, and the distal end of the leads 5-1 to 5-4 are connected to the base 12. In one embodiment shown in Fig. 6, the leads 5-1 through 5-4 pass through openings in the base 12 and are soldered into those openings.

4. Claims 59, 61-64, 66, 68-71, 89-92 are rejected under 35 U.S.C. 102(b) as being anticipated by Kanaya et al. (U.S. Patent 5,155,401).

The Kanaya reference shows and describes a recorder motor having a coded disk 32 secured to the motor shaft with an image sensor 33 in close proximity thereto for detecting the rotational angle of the coded disk 32. The positioning of the coded disk 32 relative to the coded sensor 33 is accomplished by selectively positioning the coded disk 32 on the motor shaft, and by selectively positioning, and soldering, both the sensor 33 with respect to a circuit board 35, and the circuit board 35 with respect to the motor terminals 28 and 29.

Referring now to the Examiner's objections on the basis of Kanaya, the Examiner refers to the motor terminals 28 and 29 as being the solder receiving interface between the printed circuit and the optical subassembly. Accordingly, the optical subassembly must include not only the disk 32 and its carrying shaft 17, but also the receiving member 39, the shaft 17, the bearings 15 and 16, the rotor 18, the rotor magnets 19, and the excitation coils 20 and 21. Inasmuch as these various elements are relatively moveable and not collectively rigid, the soldering of the circuit board 35 to the motor terminals 28 and 29 does not ensure that there will be no movement between the disk 32 and the image sensor 33.

Referring now to claim 59 and 66 as amended, the optical subassembly is recited as being substantially rigid, thus ensuring that once the two subassemblies are soldered together, there will be no movement between the image sensor and the optical element. This is to be contrasted with Kanaya wherein the structure between the motor terminals 28 and 29 and the disk 32 is relatively moveable.

In respect to claims 59 and 61, the Examiner suggests Kanaya, has a substantially rigid optical subassembly, even thought it includes a disk 32, a carrying shaft 19, receiving member 39, a shaft 17, bearings 15 and 16, a rotor 18, a rotor magnet 19 and excitation coils 20 and 21. The applicants believe that inasmuch as these elements are flexibly interconnected such that one part moves with respect to the other, they are not collectively a rigid subassembly.

5. Claims 13, 15, 18, 23, 24, 32, 33, 35, 37, 46, 47, 49, 52, 53, 55, 57, 83, 86-88, 95, 96, 98, 101-103, 105 and 106 are rejected under 35 U.S.C. 102(e) as being anticipated by Kropp (U.S. Patent 5,902,997). Further, claims 14, 16, 17, 19-22, 25, 34, 36, 48, 50, 51, 54, 56, 58, 84, 85, 97, 99, 100, 104, 107 and 108 are rejected under 35 U.S.C. 103(a) as being obvious over Kropp.

The Kropp reference shows a method for obtaining proper spacing between a lens and an optoelectronic component. Mounted on a base plate 1 is an optoelectronic 2 having a plurality of optically active zones 4a-4d thereon. These optically optic zones are to be aligned with respective lenses 12a-12d on a lens body spaced therefrom. The proper relative positioning of the two components is obtained in one plane by coordinating an optically active zone 4e with a protuberance highest point 21, in the "A" direction (see Fig. 1), and in another plane by the engagement of the protuberances 18 and 19 with the face of the optoelectronic component 2 to obtain the proper spacial distance "B" as shown in Figs. 1 and 2 . Thus, unlike the present invention, the relative positioning of the two components is a fixed measured distance that will be a constant distance as determined by the length of the protuberances 18 and 19. After the optoelectronic component 2 has its face engaging the protuberances 18 and 19 (thereby limiting any further relative movement between the two components), then the optoelectronic component is secured to the base plate 1 by an adhesive or solder applied at point 35, for example.

Referring now to claims 59 and 66 as amended, the optical subassembly is recited as being substantially rigid, thus ensuring that once the two subassemblies are soldered together, there will no movement between the image sensor and the optical element. This is to be contrasted with Kanaya wherein the structure between the motor terminals 28 and 29 and the disk 32 is relatively moveable.

In respect to the 102(e) rejections on the basis of Kropp in paragraph 8 of the Office Action, the Examiner says with respect to that reference that "the instant before the two subassemblies touch prior to soldering, there is no contact to prevent movement of the subassemblies relative to each other". But, inconsistent with the claims as now amended, at the time of the soldering, three is contact between the subassemblies. The protuberances shown at 18 and 19 of Fig. 1 and at 40a and 40b in Fig. 4 are integrally a part of the lens body shown at 10 and 44, respectively. The

spacial distance between the lenses and the optically active zones, are established by the protuberances which, at the time of the soldering process, prevent the optoelectronic component 2 from being moved any further toward the lenses. This is in contrast to the present invention wherein there is no restriction on the relative movement between the two components because, rather then a particular distance as is desired in the Kropp reference, the present invention is dependent on allowing variable distances in order to obtain the proper imaging performance.

In respect to claims 95 and 96, the Examiner says that Kropp allows the aligning of the subassemblies "without the main parts of the subassemblies touching each other". In this regard, claim 1, as amended, cites that no portion of the image sensor subassembly comes in contact with a portion of the optical subassembly. Clearly this is not true in the case of the Kropp reference.

In respect to claims 13, 82 and 83, the Examiner says that, "the instant before the two subassemblies touch and prior to soldering, the subassemblies can be moved freely as claimed". Again, with the amended claim language, that point is moot for the same reasons as discussed hereinabove.

In respect to claims 26 and 81, claim 26 has been amended to more specifically recite the hole and pin structure and their relationship. This claim is therefore clearly distinguished over the Kropp reference wherein the protuberance 46 comes in contact with the annular markings 52 prior to the welding process.

Claim 81 is dependent on various claims including claim 1 which is patentable for the reasons discussed hereinabove.

In regard to claims 32 and 80, the Examiner states that "Kropp further discloses (see Fig. 4) the solderable surface consisting of an pin (46) having a substantially uniform-diameter body". The applicants disagree. The element 46 in Fig. 3 which is misnumbered as items 40a and 40b in Fig. 4, is a convex protuberance and does not have a substantially uniform-diameter body but has a diameter that varies continually through its length. In this regard, the Examiner's comment with respect to "compared to the width of the subassembly, the pin has a substantially uniform-diameter", is not understood.

In regard to claims 46, 47 and 86, again, the Examiner states that "the instant before the two subassemblies touch and prior to soldering, the subassembly can be moved freely as claimed". As discussed hereinabove, the alignment process of

Kropp depends on the one subassembly coming in actual contact with the other subassembly, thereby indicating the proper spacing.

The three reference Kanaya et al., Kropp and Christensen have been discussed in applicants previous responses and need no further discussion except to respond to the Examiners further arguments.

In respect to the Examiners remarks concerning claim 46, he says that "when the subassemblies are brought together into alignment <u>or in close proximity</u> (underlining added), before soldering there is no contact between the subassemblies as claimed. What the applicants understand from this is that as the subassemblies are brought into close proximity, they are not yet in contact with each other, and this occurs prior to soldering. However, they are not yet in alignment and the alignment does not occur until they are in contact with each other, at which time the soldering does take place.

6. Claims 73, 74, 76-78, 93 and 94 are rejected under 35 U.S.C. 102(e) as being anticipated by Christensen (U.S. Patent 5,753,908).

The Christensen reference shows an imaging device including a retina board 80 upon which a linear photo sensor array 52 is mounted, with the board 80 being attached by screws 24 to a scanning carriage 10 that include lenses 20 and 22. The screws 24 pass through a pair of over sized holes 82 and 84 in the board 80 such that the board 80 can move relative to the scanning carriage 10 to allow adjustments for the first, second and third degrees of freedom as shown at 30, 32 and 34 of Fig. 5. As will be seen in Fig. 6, adjustments of the focus between the lens 22 and the photo sensor array 52 is made by moving the lens 22 in a fourth degree of freedom 36. Adjustment in the fifth degree of freedom 38 is obtained by movement of the retina board 50 by adjusting the screws 150 and 152. Of the five degrees of freedom, it is thus only the fourth degree of freedom which is comparable to the present invention, and as described hereinabove, Christensen only suggest that the lens 22 be positionally adjusted with respect to the photo sensor array 52. But he does not describe or suggest how that is accomplished or how those elements are positioned and fixed in place.

With regard to the 102(e) rejections on the basis of Christensen, as set forth in paragraph 9 of the Office Action, the Examiner appears to be stating that the printed circuit board 80 is a part of the optical subassembly 10. If one chooses this

construction, then, as shown in Fig. 4, the sockets 90 and 100 which are soldered into the printed circuit board 80, must also be considered part of the "optical subassembly". Then, there is no "solder receiving interface between the substantially rigid planar member and the optical subassembly" as suggested by the Examiner. The interface is rather by a way of "Pins in Carrier Type IC Socket" arrangement as described in lines 33-47 of column 5. That is, the solder interface is on the "optical subassembly" as defined by the Examiner, but it is not "between" the rigid planar member and the optical subassembly as recited in the applicant's claims.

In view of the foregoing comments and discussions the appellants believe that the Examiner has not made a *prima facie* case for the unpatentability of the claims and that the claims are patentable distinguishable over the cited references.

IX. CONCLUSION

The appellants therefore request that the rejection of the Examiner be reversed and that the appealed claim be allowed to issue.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-0289.

Respectfully submitted,

WALL MARJAMA & BILINSKI LLP

Date: April 10, 2003

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PATENT TRADEMARK OFFICE

APPENDIX A

1. A method for mounting an optical subassembly of an optical reading device to an image sensor subassembly of an optical device, said method comprising the steps of:

moving said optical subassembly and said image sensor subassembly in proximity with one another; and

soldering said optical and image sensor subassemblies together using a solder material, wherein at the time of said soldering step there is no contact between said optical subassembly and said image sensor subassembly that prevents free movement of said optical subassembly and said image sensor subassembly in either of a vertical or a horizontal direction.

2. The method of claim 1, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies.

3. The method of claim 1, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies, wherein said forming step includes the step of overmolding non-solderable material onto solderable material to form said solderable surface.

4. The method of claim 1, further comprising the step of forming a solderable surface on at least one of said optical or image sensor subassemblies, wherein said forming step includes the step of plating a solderable material onto a non-solderable material.

5. The method of claim 1, further comprising the step of forming a solderable material on at least one of said optical or image sensor subassemblies, wherein said forming step includes the step of insert molding solderable material in non-solderable material.

6. The method of claim 1, further comprising the step of forming a solderable surface on said optical subassembly, wherein said forming step includes

the step of making a frame for said optical subassembly comprising essentially solderable material.

7. The method of claim 1, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies, wherein said forming step includes the step of making said solderable surface in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface.

8. The method of claim 7, wherein said at least one solderable surface is in the configuration of a pin.

9. The method of claim 8, wherein said pin comprises a substantially uniform-diameter.

10. The method of claim 7, when said at least one solderable surface is in the configuration of a threaded screw.

11. The method of claim 1, further comprising the step of forming a first solderable surface on one of said subassemblies and a second solderable surface in said other of said subassemblies, wherein said first solderable surface is made in the configuration of a pin driving a substantially uniform-diameter body, and said second solderable surface is made in the configuration of a through-hole, wherein said pin has a diameter smaller than said hole to allow positional adjusting of said optical subassembly relative to said image sensor subassembly.

12. The method of claim 11, wherein said hole is a through-hole.

13. A method for mounting an optical subassembly to an image sensor subassembly, said method comprising the steps of:

forming at least one solderable surface on at least one of said optical and image sensor subassemblies;

moving said optical subassembly in proximity with said image sensor subassembly to define an interface delimited by said at least one solderable surface of said optical subassembly or said image sensor subassembly; and

soldering said optical subassembly and said image sensor subassembly together at said interface, wherein said optical subassembly and said image sensor subassembly are configured so that said image sensor subassembly and said optical subassembly can be moved freely relative to one another in at least either of a vertical or a horizontal direction immediately prior to said soldering step.

14. The method of claim 1, further comprising the steps of forming a solderable pin on one of said subassemblies, and making a hole for receiving said pin on the remaining of said subassemblies.

15. The method of claim 1, wherein said method further comprises the step, after said moving step, of aligning said optical subassembly and image sensor subassembly using a video monitor which displays an output indicative of an output of said image sensor.

16. The method of claim 1, wherein there is further no contact between said subassemblies which prevents free relative movement between said assemblies in a z-direction.

17. A method for mounting an optical subassembly to an image sensor subassembly, said method comprising the steps of:

forming at least one solderable surface on at least one of said optical and image sensor subassemblies;

moving said optical subassembly in proximity with said image sensor subassembly to define an interface delimited by said at least one solderable surface of said optical subassembly or said image sensor subassembly; and

soldering said optical subassembly and said image sensor subassembly together at said interface, wherein said optical subassembly and said image sensor subassembly are configured so that said image sensor subassembly and said optical

subassembly can be moved freely relative to one another in at least either of an x or y direction immediately prior to said soldering step.

18. The method of claim 17, wherein said forming step includes the step of overmolding non-solderable material onto solderable material.

19. The method of claim 17, wherein said forming step includes the step of plating a solderable material onto non-solderable material.

20. The method of claim 17, wherein said forming step includes the step of insert molding solderable material in non-solderable material.

21. The method of claim 17, wherein said forming step includes the step of making a frame for said optical subassembly comprising essentially solderable material.

22. The method of claim 13, wherein said forming step includes the step of making a first solderable surface in one of said subassemblies and a second solderable surface in said other of said subassemblies, wherein said first solderable surface is in made in the configuration of a pin having a substantially uniform-diameter body, and a said second solderable surface is made in the configuration of a through-hole having a diameter larger than said body.

23. The method of claim 22, wherein said at least one solderable surface is in the configuration of a pin.

24. The method of claim 23, wherein said pin is of a substantially uniform-diameter.

25. The method of claim 22, wherein said at least one solderable surface is provided by a threaded screw.

26. An image sensor subassembly comprising:

a substantially rigid member;

an image sensor chip disposed on said substantially rigid member;

a solderable surface formed on said substantially rigid member, said solderable surface being of a configuration selected from the group consisting of a hole or pin for receiving in surrounding but not engaging relationship a corresponding pin or hole; and a solder material disposed between said hole or pin and said pin or hole.

27. The method of claim 26, wherein said hole is a through-hole.

28. The method of claim 17, wherein said forming step includes the step of making a first solderable surface in one of said subassemblies and a second solderable surface in said other of said subassemblies, wherein said first solderable surface is in made in the configuration of a pin having a substantially uniform-diametered body, and a said second solderable surface is made in the configuration of a through-hole having a diameter larger than said pin body.

29. The method of Claim 17, when said forming step includes the steps of forming a solderable pin on one of said subassemblies and a hole for receiving said pin on said other of said subassemblies.

30. The method of claim 17, wherein said moving step includes the step of aligning optical elements of said optical subassembly with imaging elements of said image sensor subassembly.

31. The method of claim 17, wherein said aligning step includes the steps of:

exposing said image sensor subassembly to a predetermined test target; and

observing indicia representing electrical signals generated by said image sensor.

32. The method of claim 17, wherein said subassemblies are further configured to be freely moved in the z-direction immediately prior to said soldering step.

33. An image sensor subassembly comprising:

a substantially rigid member;

an image sensor chip disposed on said substantially rigid member; and

a solderable surface formed on said substantially rigid member, said solderable surface being of a configuration selected from the group consisting of a through-hole, a pin having a substantially uniform-diametered body, or a threaded screw.

34. The image sensor subassembly of claim 33, wherein said solderable surface is made in an irregular configuration having an increased surface area per unit three dimensional space relative a smooth surface.

35. The image sensor subassembly of claim 33, wherein said solderable surface is in the configuration of a substantially uniform-diametered pin.

36. The image sensor subassembly of claim 33, wherein said solderable surface is in the configuration of a pin having a substantially uniform-diametered body.

37. The image sensor subassembly of claim 33, wherein said solderable surface is provided by a threaded screw.

45. The method of claim 1, wherein said method further comprises the step, after said moving step, of aligning said optical subassembly and image sensor subassembly using a video monitor which displays an output indicative of an output of said image sensor subassembly.

46. A method for making an optical and image sensor assembly, said image sensor assembly comprising an optical image sensor subassembly and an image sensor subassembly, said method comprising the steps of:

aligning said optical subassembly and said image sensor subassembly relative to one another without contacting said optical subassembly and said image sensor subassembly against one another in a manner that prevents free movement of said subassemblies relative to one another in either of a vertical or a horizontal direction; and

when said optical subassembly and said image sensor assembly are properly aligned, securing said optical subassembly and said image sensor subassembly together.

47. The method of claim 46, further comprising the step of forming a solderable surface on at least one of said optical subassembly or said image sensor subassembly, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

48. The method of claim 46, further comprising the step of forming a solderable surface on at least one of said optical assembly or said image sensor assembly, wherein said forming step includes the step of overmolding non-solderable material onto solderable material to form said solderable surface, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

49. The method of claim 46, further comprising the step of forming a solderable surface on at least one of said optical or image sensor subassembly, wherein said forming step includes the step of plating a solderable material onto a non-solderable material, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

50. The method of claim 46, further comprising the step of forming a solderable material on at least one of said optical or image sensor subassembly, wherein said forming step includes the step of insert molding solderable material in non-solderable material, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

51. The method of claim 45, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies, wherein said forming step includes the step of making said solderable surface in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

52. The method of claim 46, further comprising the step of forming a solderable surface on at least one of said optical subassembly or said image sensor subassembly, wherein said forming step includes the step of making said solderable surface in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

53. The method of claim 51, wherein said at least one solderable surface is in the configuration of a pin.

54. The method of claim 51, when said at least one solderable surface is in the configuration of a threaded screw.

55. The method of claim 51, wherein said at least one solderable surface is in the configuration of a hole.

56. The method of claim 46, further comprising the step of forming a first solderable surface on one of said optical subassembly or image sensor subassembly and a second solderable surface in said other of said optical subassembly or image sensor subassembly, wherein said first solderable surface is in made in the configuration of a pin, and said second solderable surface is made in the configuration of a hole, wherein said pin has a diameter smaller than said hole to allow positional adjusting of said optical subassembly relative to said image sensor subassembly, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

57. The method of Claim 46, further comprising the steps of forming a solderable pin on one of said optical subassembly on image sensor assembly, and making a hole for receiving said pin on the remaining of said subassemblies, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

58. The method of claim 45, further comprising the steps of forming a solderable pin on one of said subassemblies, and making a hole for receiving said pin on the remaining of said subassemblies, and wherein said securing step includes the step of soldering said optical subassembly and said image sensor subassembly together using a solder material.

59. An imaging device comprising:

an image sensor subassembly including an image sensor mounted on a printed circuit board;

a substantially rigid optical subassembly, said optical subassembly including an optical element disposed on a substantially rigid member;

at least one solderable surface formed on either of said printed circuit board or said optical subassembly defining at least one solder receiving interface between said printed circuit board and said optical subassembly; and

solder material for bonding said subassemblies disposed at said at least one solder-receiving interface.

60. The method of claim 45, wherein said aligning step further includes the step of moving said subassemblies without contact in a manner that prevents free movement of said subassemblies in a z-direction.

61. An imaging device comprising:

an image sensor subassembly including an image sensor mounted on a printed circuit board;

an optical subassembly, said optical subassembly including an optical element disposed on a substantially rigid member;

at least one solderable surface formed on either of said printed circuit board or said optical subassembly defining at least one solder receiving interface between said printed circuit board and said optical subassembly; and

solder material for bonding said subassemblies disposed at said at least one solder-receiving interface.

62. The device of claim 61, further including a housing encapsulating said device, said device partially defining a feed path.

63. The device of claim 61, further including a housing encapsulating said device, said housing including a handle.

64. The device of claim 61, wherein said at least one solderable surface is made in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface.

65. The device of claim 61, wherein said at least one solderable surface is made in the configuration of a hole.

66. An imaging device comprising:

an image sensor subassembly including an image sensor mounted on a printed circuit board;

a substantially rigid optical subassembly, said optical subassembly having a single receive optical axis and including an optical element disposed on a substantially rigid member;

at least one solderable surface formed on either of said image sensor subassembly or optical subassembly defining at least one solder receiving interface between said image sensor subassembly and said optical subassembly; and

solder material for bonding said subassemblies disposed at said at least one solder-receiving interface.

67. The device of claim 61, wherein said at least one solderable surface is in the configuration of a pin.

68. The method of claim 67, wherein said pin comprises a substantially uniform-diameter body.

69. The device of claim 61, wherein said at least one solderable surface is provided by a threaded screw.

70. An imaging device comprising:

an image sensor subassembly including an image sensor mounted on a printed circuit board;

an optical subassembly, said optical subassembly having a single receive optical axis and including an optical element disposed on a substantially rigid member;

at least one solderable surface formed on either of said image sensor subassembly or optical subassembly defining at least one solder receiving interface between said image sensor subassembly and said optical subassembly; and

solder material for bonding said subassemblies disposed at said at least one solder-receiving interface.

71. The device of claim 70, further comprises a housing encapsulating said device said housing partially defining a feed path for receiving documents.

72. The device of claim 70, further comprising a housing encapsulating said device said housing including a handle.

73. The device of claim 70, wherein said at least one solderable surface is made in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface.

74. The device of claim 70, wherein said at least one solderable surface is made in the configuration of a hole.

75. The device of claim 74, wherein said hole is through-hole.

76. The device of claim 75, wherein said at least one solderable surface is in the configuration of a pin.

77. The device of claim 76, wherein said pin has substantially uniform-diametered body.

78. The device of claim 70, wherein said at least one solderable surface is provided by a threaded screw.

79. An optical reading device comprising:

an optical and image sensor assembly including

an image sensor subassembly including an image sensor mounted on a substantially rigid planar member,

an optical subassembly, said optical subassembly including an optical element disposed on a substantially rigid member,

at least one solderable surface formed on either of said optical subassembly or said substantially rigid planar member defining at lease one solder receiving interface between said substantially rigid planar member and said optical subassembly,

solder material for bonding said subassemblies disposed at said at least one solder-receiving interface,

a housing, said optical and image sensor assembly being disposed in said housing.

80. The method of claim 8, wherein said pin comprises a substantially uniform-diameter.

81. The method of claim 10, wherein said hole is a through-hole.

82. The method of claim 1, wherein there is further no contact between said subassemblies which prevents free relative movement between said assemblies in a direction normal to each other.

83. The method of claim 13, wherein said subassemblies are further configured to be freely moved in a direction normal to each other immediately prior to said soldering step.

84. The method of claim 19, wherein said pin is of a substantially uniform-diameter.

85. The method of claim 21, wherein said hole is a through-hole.

86. The method of claim 46, aligning step further includes the step of moving said subassemblies without contact in a manner that prevents free movement of said subassemblies in a direction normal to each other.

87. The method of claim 52, wherein said pin has a substantially uniform-diameter body.

88. The method of claim 55, wherein said hole is a through-hole.

89. The method of claim 63, wherein a hole is a through-hole.

90. The method of claim 64, wherein said pin comprises a substantially uniform-diameter body.

91. The device of claim 70, wherein said hole is through-hole.

92. The device of claim 71, wherein said pin has substantially uniform-diametered body.

93. The device of claim 73, wherein said hole is a through-hole.

94. The device of claim 78, wherein said pin comprises a substantially uniform-diametered body.

95. A method for mounting an optical subassembly of an optical reading or imaging device to an image sensor subassembly of an optical reading or imaging device, said method comprising the steps of:

moving said optical subassembly and said image sensor subassembly in proximity with one another;

aligning said optical subassembly with said image sensor subassembly; and

without a portion of said image sensor subassembly being in contact with a portion of said optical subassembly, soldering said optical subassembly and said image sensor subassembly together using a solder material.

96. The method of claim 95, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies.

97. The method of claim 95, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies, wherein said forming step includes the step of overmolding non-solderable material onto solderable material to form said solderable surface.

98. The method of claim 95, further comprising the step of forming a solderable surface on at least one of said optical or image sensor subassemblies, wherein said forming step includes the step of plating a solderable material onto a non-solderable material.

99. The method of claim 95, further comprising the step of forming a solderable material on at least one of said optical or image sensor subassemblies, wherein said forming step includes the step of insert molding solderable material in non-solderable material.

100. The method of claim 95, further comprising the step of forming a solderable surface on said optical subassembly, wherein said forming step includes the step of making a frame for said optical subassembly comprising essentially solderable material.

101. The method of claim 95, further comprising the step of forming a solderable surface on at least one of said optical subassemblies or said image sensor subassemblies, wherein said forming step includes the step of making said solderable surface in an irregular configuration having an increased surface area per unit three dimensional space relative to that of a smooth surface.

102. The method of claim 101, wherein said at least one solderable surface is in the configuration of a pin.

103. The method of claim 101, wherein said at least one solderable surface is in the configuration of a pin having a substantially uniform-diametered body.

104. The method of claim 95, when said at least one solderable surface is in the configuration of a threaded screw.

105. The method of claim 101, wherein said at least one solderable surface is in the configuration of a hole.

106. The method of claim 101, wherein said at least one solderable surface is in the configuration of a through-hole.

107. The method of claim 95, further comprising the step of forming a first solderable surface on one of said subassemblies and a second solderable surface in said other of said subassemblies, wherein said first solderable surface is in made in the configuration of a pin having a substantially uniform-diametered body, and said second solderable surface is made in the configuration of a through-hole, wherein said pin body has a diameter smaller than said through-hole to allow positional adjusting of said optical subassembly relative to said image sensor subassembly.

108. The method of claim 95, further comprising the steps of forming a solderable pin on one of said subassemblies, and making a through-hole for receiving said pin on the remaining of said subassemblies.